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November 15, 2018

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Mr. Daryl Reed, State Project Officer
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Montana Department of Environmental Quality
Remediation Division
P.O. Box 200901
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Re: BUTTE MINE FLOODING SITE CD, CV 02-35 Bu-RFC, 2018 Third Quarter Report

Dear Mr. Morgan, Mr. Elsen, Mr. Greene, and Mr. Reed:

The Settling Defendants (Atlantic Richfield Company and the MR Group, as defined in the Consent Decree) continue to implement the remedial action requirements as specified in the Statement of Work to the Consent Decree. The attached report summarizes those activities conducted during the Third Quarter of 2018.

Please contact us if you would like to discuss this BMFOU Quarterly Report.

On behalf of the Settling Defendants,

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Vice President of Environmental Affairs
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Tim Hilmo, P.E., Operations Project Manager
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Attachments:

Settling Defendants Butte Mine Flooding Operable Unit (BMFOU) Quarterly Report Consent Decree for the Butte Mine Flooding Site CD, CV 02-35 Bu-RFC Remedial Action – Implementation of the Remedy Third Quarter, 2018 (July 1 – September 30, 2018)

SETTLING DEFENDANTS
BUTTE MINE FLOODING OPERABLE UNIT (BMFOU) QUARTERLY REPORT
CONSENT DECREE FOR THE
BUTTE MINE FLOODING SITE CD, CV 02-35 Bu-RFC
REMEDIAL ACTION – IMPLEMENTATION OF THE REMEDY
THIRD QUARTER 2018 (JULY 1 – SEPTEMBER 30, 2018)

The Settling Defendants[1] continue to implement the Remedial Action (RA) requirements of the Butte Mine Flooding Operable Unit (BMFOU) specified in the Statement of Work to the Consent Decree (CD). This report summarizes those activities conducted during the third quarter of 2018 as required under *Section X. Reporting Requirements, Paragraphs 31 and 35* of the CD. The headings a) through g) in the following report sections correspond to the categories identified in Paragraph 31. The sections captioned *h) Issues Encountered, i) Five-Year Review Recommendations Status,* and *j) Other* have been added at the request of the U.S. Environmental Protection Agency (EPA).

a) Actions taken toward achieving compliance with the Consent Decree

To achieve compliance with the CD, the Settling Defendants conducted RA activities under the seven components identified in the *Statement of Work for Remedial Design/Remedial Action* ("SOW") which is Appendix C of the CD. These seven components and the RA activities undertaken by the Settling Defendants (hereinafter referred to as "SDs") in the third quarter of this year include:

1. **Monitoring Program -** The Montana Bureau of Mines and Geology (MBMG) conducted monitoring activities as required by the SOW with the exception of monthly sampling of the Granite Mountain Mine shaft. Water level measurements of the Granite Mountain Mine shaft have not been completed since July 2016 due to an obstruction in the shaft at a depth of 420 feet and safety concerns with accessing the area around the shaft. The MBMG is currently working with the SDs to develop a plan to reestablish this monitoring location.

   Berkeley Pit samples were collected on September 19, 2018. Results of the sampling will be reported in a forthcoming monthly report from the MBMG.

   On May 16 and 17, 2018, Atlantic Richfield on behalf of the SDs, conducted field exercises to evaluate alternative unmanned methods for data collection (e.g., profiles, water quality sampling, etc.) of the Berkeley Pit using aerial drone technology.

2. **Public Education and Involvement** – The SDs are represented on the Berkeley Pit Public Education Committee which directs publication of the PITWatch and the website

[1] The term Settling Defendants, as used in this report, collectively refers to Atlantic Richfield Company, Montana Resources, Inc., Montana Resources LLP, and Dennis Washington.

www.PITWATCH.ORG. These are the primary vehicles for educating the public about the BMFOU status and activities. During the third quarter of 2018, PITWatch did not conduct any meetings. The PITWatch committee, with support from the SDs, is developing additional content for publishing, and educating the public about BMFOU and RA activities.

In addition, as part of a sponsored research agreement between the SDs and Montana Tech, various local waterfowl experts from around Butte and western Montana participate in the Berkeley Pit Migratory Waterfowl Mitigation Advisory Board (Waterfowl Advisory Board), which provides advice to SDs on avian-related Pit topics, including, but not limited to, ways to deter birds from landing and remaining in the Pit. The Waterfowl Advisory Board met on August 17, 2018 and their efforts are described further in Section 6: Waterfowl Mitigation. Further information about Waterfowl Advisory Board activities and advice is contained in the SD's Berkeley Pit Migratory Waterfowl Monthly Reports. Meeting agendas/minutes of the Waterfowl Advisory Board are available upon request.

3. **Horseshoe Bend ("HsB") Inflow Control** – The SOW requires integration of the HsB flow into mine operations and/or release of treated water into Silver Bow Creek. Since the BMFOU *Record of Decision* (ROD) was issued in 1994 and treated HsB water was integrated into the mining and milling process on April 15, 1996, the flow has become an integral part of the water balance for efficient active mining and milling operations at MR. Treated HsB Water Treatment Plant (WTP) water has been integrated into MR's milling water circuit since the HsBWTP was commissioned in November 2003.

   During this quarter, a total volume of approximately 409 million gallons were treated and zero gallons were bypassed to the Berkeley Pit.

   Significant maintenance activities at the HsBWTP completed during the third quarter included:

   - Wiring in the Stage 2 reactor drive house was rerouted to allow the drive and mixer to be removed through the roof.
   - Stage 2 reactor mixer was replaced.
   - New flow meter was installed in the Stage 2 recycle line.
   - Stage 2 recycle pump was replaced twice.
   - Stage 1 and 2 blower lines were lowered and re-anchored to the floor of the reactors.
   - Influent pump No. 114 was changed.
   - North Slurry pump No. 1 was replaced.
   - New hot water heaters were installed for the polymer hot water system.

   Stage 2 cleanout was completed on August 8, 2018 and Stage 1 was brought back online. The HsBWTP operated on two stages until August 24, 2018 when Stage 1 was bypassed and taken out of service to repair the blower line in the Stage 1 reactor. The HsBWTP was returned to two-stage operation on September 6, 2018 and continued operating on two stages through the rest of the quarter.

4. **HsB Water Treatment Plant Upgrade/Sludge Repository** – The SDs have initiated the HsBWTP Remedial Action Adequacy Review (RAAR) to ensure that ongoing and future remedial activities meet the requirements of the CD. Table 1 identifies the primary tasks of the RAAR and current status of those tasks.

Table 1 – RAAR Primary Tasks and Third Quarter Status

RAAR Items	Quarter 3 2018 Status
RAAR Schedule	The preliminary draft schedule for the BMFOU RAAR was submitted on June 30, 2014 and approved by the Agencies on September 11, 2014. An updated BMFOU RAAR schedule, prepared by the SDs and the "Supervising Contractor" Arcadis, is included as Attachment 1. The BMFOU RAAR schedule will be followed and modified, as needed, with modifications approved by the Agencies. The comprehensive list of activities in the schedule was identified to meet the milestones required in the CD and also to complete important precursor activities to ensure continued protectiveness of the remedy.
HsBWTP O&M Short-Term (Phase 1) Optimization	The *Final BMFOU RAAR Horseshoe Bend Water Treatment Plant Short Term Optimization Report* was submitted to the Agencies on May 30, 2018. The SDs have initiated recommendations to the HsBWTP as recommended by the report. The status of the recommendations is provided in Attachment 2 and includes any work completed in the third quarter of 2018.
HsBWTP O&M Long-Term (Phase 2) Optimization	The *Final Remedial Action Adequacy Review Phase 2 HsBWTP Optimization Evaluation Work Plan* was submitted to the Agencies on September 5, 2018. The SDs continued Pilot Study field activities in the third quarter of 2018.
BMFOU Phase 1 Site-wide Water Balance Study	The SDs submitted the *Draft BMFOU RAAR Phase 1 Water Balance Technical Memorandum* (Arcadis, 2018) on February 23, 2018. The Agencies provided comments to the draft on April 23, 2018. The approved *Final BMFOU RAAR Phase 1 Water Balance Technical Memorandum* was submitted to the Agencies on August 24, 2018.
BMFOU Phase 2 Site-wide Water Balance	The SDs submitted the *Draft BMFOU RAAR Phase 2 Water Balance Work Plan* on August 7, 2018. The Agencies provided comments on the draft work plan on September 26, 2018.
Quality Assurance Plan and Procedures/ Sampling and Analysis Plan	The SDs submitted the *Draft Field Sampling Plan, Butte Mine Flooding Operable Unit, Butte, Montana* (Arcadis, 2018) to the Agencies on March 30, 2018. The Agencies provided comments to the draft on May 14, 2018. The SDs submitted a revised draft and associated SD's responses to Agency comments on August 28, 2018.

RAAR Items	Quarter 3 2018 Status
Sludge Disposal/Repository Evaluation	The Explanation of Significant Differences, Appendix A to the CD, allows sludge to be placed into the Pit. During the third quarter, all the sludge generated by the HsBWTP was placed into the Pit (see Table 2 in Section b). Evaluating sludge disposal alternatives is also included as an activity on the BMFOU RAAR schedule. The Sludge Disposal/Repository Evaluation has been incorporated into the Phase 2 HsBWTP Long-Term Optimization Evaluation and is detailed in the Work Plan.
Berkeley Pit and Discharge Pilot Project	The SDs submitted a letter to the Agencies on January 25, 2018 seeking preliminary approval from the Agencies for the Berkeley Pit and Discharge Pilot Project (Discharge Pilot). The Agencies provided a letter in response on February 27, 2018 approving the Discharge Pilot project in concept. The SDs submitted the Draft Berkeley Pit and Discharge Pilot Project Work Plan – Appendix B Discharge System Work Plan to the Agencies on September 24, 2018. The SDs provided a Draft Hydrotest Execution Plan Horseshoe Bend Effluent Line to the Agencies on June 22, 2018 for approval to conduct hydrotesting on the Horseshoe Bend Effluent Line (HBEL). The Agencies provided comments on July 11, 2018. The SDs filed a Request for Change (RFC) on July 17, 2018 addressing necessary dewatering for the HBEL hydrotest.
RAAR Technical Memorandum	The SDs are currently working on a draft to be submitted to the Agencies as indicated in the current RAAR schedule.

5. **West Camp System** – During the third quarter of 2018, approximately 35.5 million gallons of water were pumped from the West Camp Pump Station (WCP-1) to Lower Area One (LAO) for treatment in the Butte Treatment Lagoons (BTL) system. Operators of the BTL maintained normal operating levels below the critical water level the entire quarter. The water level at the end of the third quarter was 5,421.81 feet (National Geodetic Vertical Datum [NGVD] 29). This is below the West Camp Critical Water Level of 5,435 feet (NGVD 29).

6. **Waterfowl Mitigation** – During the reporting period, the SDs conducted migration monitoring, waterfowl identification training, observation and active and passive hazing efforts of waterfowl, as well as reporting as required by the *Berkeley Pit Migratory Waterfowl Mitigation Plan Observation and Hazing Program* (Exhibit 5 to the CD).

   A rotational slump of the highwall in the southeast sector of the Berkeley Pit occurred on February 8, 2013. This slope failure and the potential for continuing slope instability in the

Pit has created a safety issue for manned on-the-water activities. To mitigate that risk, the SDs have been developing and evaluating drone, remote-controlled vehicles, and other methods that can deter waterfowl from landing or staying in the Pit. These efforts are documented in the monthly waterfowl reports.

The SDs submitted the *BMFOU – Berkeley Pit Waterfowl Mitigation Plan, Interim Measures for Fall 2017 Migration* on August 18, 2017 to the Agencies for review and comment. The Agencies provided comments on October 2, 2017. The SDs submitted the *Response to EPA's Comment Letter of October 2, 2017 for Butte Mine Flooding Operable Unit (BMFOU) – Proposed Additional Bird Mitigation and Hazing Techniques for the Berkeley Pit, Fall 2017* on March 16, 2018.

The SDs submitted a preliminary draft outline/Table of Contents for the *Updated BMFOU – Berkeley Pit Waterfowl Mitigation Plan Observation and Hazing Program* on December 28, 2017 to the Agencies for review and comment. The Agencies provided comments to the draft outline/Table of Contents to the SDs on February 22, 2018. The SDs submitted the *Silver Bow Creek/Butte Area NPL Site Butte Mine Flooding Operable Unit – Draft Final Berkeley Pit Waterfowl Protection Plan* (SDs, 2018) to the Agencies on August 10, 2018. The Waterfowl Advisory Board provided and discussed its recommendations to the *Draft Final Berkeley Pit Waterfowl Protection Plan* (EPA, 2018) with the SDs and the Agencies at its meeting on August 17, 2018. It was confirmed by the Agencies at this meeting that the SDs will continue to implement the Spring and Fall Interim Plans during the fall migration season, which began on August 15, 2018. The SDs received the Agencies comments on the *Draft Final Berkeley Pit Waterfowl Protection Plan* (EPA, 2018) on September 24, 2018.

Also during the reporting period, the SDs underwent waterfowl identification training provided by Dr. Stella Capoccia, Montana Tech and Gary Swant of the Waterfowl Advisory Board on August 30 and 31 and September 6 and 7, 2018. These trainings are conducted to provide the SDs' observation and hazing personnel and contractors with updates to waterfowl mitigation practices, migration information and to improve waterfowl identification data collection at the Pit.

During the third quarter, the SDs prepared the *Berkeley Pit Migratory Waterfowl Mitigation Monthly Reports* which included detailed descriptions of the mitigation efforts conducted, along with the observation and hazing logs. The following waterfowl mitigation reports were submitted to the Agencies in the third quarter:

1. The *June 2018 Berkeley Pit Migratory Waterfowl Mitigation Monthly Report* SDs, 2018), submitted on July 17, 2018.
2. The *July 2018 Berkeley Pit Migratory Waterfowl Mitigation Monthly Report* (SDs, 2018), submitted on August 13, 2018.
3. The *August 2018 Berkeley Pit Migratory Waterfowl Mitigation Monthly Report* (SDs, 2018), submitted on September 19, 2018

Atlantic Richfield, on behalf of the SDs, conducted a demonstration using stationary, automated lasers at the Warm Springs Ponds (WSP) in support of ongoing evaluations of waterfowl hazing and deterrent technologies for potential use at the Pit. The Agencies approved the *BMFOU – Waterfowl Mitigation Plan Warm Springs Ponds (WSP) Laser Demonstration Scope of Work (SOW)* (Atlantic Richfield Company, 2018) on August 6, 2018. On the evenings of September 11 through 13, 2018, Atlantic Richfield conducted the WSP laser demonstration. Results from this demonstration are being evaluated and may be provided or discussed in a future report.

7. **Institutional Controls** – The SDs achieved full compliance with this component of the RA SOW by providing funding in 2002 under past and future cost cash-out provisions of the CD. The Butte Alluvial and Bedrock Controlled Ground Water Area (BABCGWA) was established by the Montana Department of Natural Resources and Conservation (DNRC) in October 2009 with Butte-Silver Bow County as the petitioner. Implementing and monitoring the BABCGWA was assigned to the MBMG. Please see the *Butte Mine Flooding Operable Unit, Water-Level Monitoring and Water-Quality Sampling, 2012 Consent Decree Update, 1982-2012* (MBMG, 2013) and consult Mr. Terrence E. Duaime, Project Manager of the MBMG for more detailed information.

   Access **-** The SDs have fully complied with the CD requirement to provide access to the Agencies. Access was provided to the MBMG personnel to conduct monitoring.

b) <u>Summary of all results of sampling and tests and all other data generated in the previous quarter</u>

Table 2 summarizes the performance of the HsBWTP in the third quarter of 2018, and in total for the year.

Table 2 – HsBWTP Third Quarter Performance Table

Period	Influent (MG[1])	HSB Plant Water[2] (MG)	Sludge Wasted (MG)	Lime Delivered (tons)	Average Influent Flow (MGD)	Average Lime Usage (mg/L)
Quarter 1	393	369	14.5	3,022	4.4	1,845
Quarter 2	410	375	25.6	3,224	4.5	1,885
Quarter 3	409	389	16.0	3,907	4.4	2,292
Quarter 4						
Total	1,212	1,133	56.1	10,153	4.4	2,007

[1]MG: millions of gallons. MGD: millions of gallons per day. mg/L: milligrams per Liter.

[2]The treated HsB water that is used in MR's milling process as required by the CD will be referred to as "HsB Plant Water" instead of the previously used term "effluent". This semantics change has been made to distinguish between effluent that eventually will be treated to the discharge standards stipulated in the CD SOW, and treated plant water that is included in MR's milling process.

The HsBWTP water is sampled at multiple locations including the HsBWTP influent, Stage 1 Clarifier overflow (during 2 stage operation), and Plant Water (formerly named plant effluent). These data will be used in the RAAR HsBWTP optimization currently ongoing. The testing demonstrates that the current operation of the HsBWTP satisfactorily complies with the requirement of the CD to treat HsB water that is to be incorporated in MR's milling circuit.

In the vicinity of the HsBWTP, engineering controls associated with groundwater monitoring and dewatering to manage the groundwater elevation continued to operate. The *Horseshoe Bend Water Treatment Plant Groundwater Level Reduction Project Quarterly Report* is included as Attachment 3 to this report.

c) Identify all work plans and other deliverables required by this Consent Decree completed and submitted in the previous quarter

The following lists the deliverable required by the CD, and relevant to the BMFOU, completed or submitted to the Agencies in the third quarter of 2018 and not otherwise listed elsewhere in this document [specifically in a) 4. and a) 6.]:

1. *Contract No. 415008-TO-2, Butte Mine Flooding-July 2018 Monthly Report, BMFOU Consent Decree 02-35-BU-SEH* (MBMG, 2018) was submitted on August 13, 2018.

d) Describe all actions, data collection and implementation or work plans that may be required under this CD scheduled for the next quarter and provide other information relating to the progress of the work

RA Activity - The anticipated activity summary for the fourth quarter of 2018 is organized in the following seven components identified in the SOW, with an eighth component describing other progress of the work not specifically required by the CD:

1. **Monitoring Program -** The Monitoring Program will continue to be implemented during the next quarter, with the exception of the Granite Mountain Mine shaft. The MBMG and SDs will continue to develop a plan to reestablish the Granite Mountain Mine shaft monitoring location. The SDs will continue to cooperate in providing access and offer assistance to the MBMG in performing this task.

2. **Public Education and Involvement** – The SDs will provide information to the Agencies as requested and participate in any public education meetings or activities that the Agencies deem necessary to fulfill this requirement of the CD.

3. **Horseshoe Bend ("HsB") Inflow Control** – The HsBWTP will continue to operate in the next quarter with the goal of capturing and treating flow emanating from the HsB area. The Inflow Control requirement will continue to be met with the HsBWTP treated water being integrated into the mining and milling operations. Operation of the dewatering system around the HsBWTP will continue.

   The SDs will continue to progress the RAAR as described in the RAAR schedule (Attachment 1).

4. **HsB Water Treatment Plant Upgrade/Sludge Repository** – Current work associated with the HsBWTP Upgrade/Sludge Repository generally include continuing with RAAR-related work per the current RAAR schedule and as indicated in Table 1. Sludge from the HsBWTP will continue to be placed into the Pit during the next quarter.

5. **West Camp System** – Pumping from WCP-1 will continue to maintain West Camp water levels below the critical water level.

6. **Waterfowl Mitigation** – Waterfowl mitigation efforts will continue as required by Exhibit 5 of the CD, subject to the approved variance from manned on-the-water activities on the Pit water surface. The following activities will be completed in addition to waterfowl mitigation efforts as described in the *Draft Final BMFOU – Berkeley Pit Waterfowl Protection Plan* (SDs, 2018):
   - The SDs will continue to implement and evaluate additional waterfowl mitigation activities identified in the *BMFOU – Berkeley Pit Waterfowl Mitigation Plan*, *Interim Measures for Fall 2017 Migration* and *Proposed Additional Bird Mitigation and Hazing Techniques for the Berkeley Pit Spring 2017.*
   - The SDs anticipate providing responses to Agency comments on the *Draft Final BMFOU – Berkeley Pit Waterfowl Protection Plan* (SDs, 2018) in the fourth quarter of 2018.

7. **Institutional Controls** – The Institutional Controls required by the CD will continue to be met with full access provided to the Agencies and MBMG at reasonable times. MR plans to continue to operate the active mining and milling operations within the stipulations of *Section IX. Access and Institutional Controls* of the CD.

8. **Other** – During the fourth quarter of 2018, the SDs will continue to progress the Discharge Pilot Project to include:

    - Atlantic Richfield, on behalf of the SDs, plans to finalize the document, and began the work associated with the *Draft Hydrotest Execution Plan Horseshoe Bend Effluent Line* (Atlantic Richfield Company, 2018).
    - Atlantic Richfield, on behalf of the SDs, and in consultation with the Agencies, will continue to design and build the components associated with the *Draft Berkeley Pit and Discharge Pilot Project Work Plan – Appendix B Discharge System Work Plan* (Wood, 2018).
    - The SDs will continue to design and construct the Discharge System pipelines.
    - MR, on behalf of the SDs, will continue to design and build the Onsite Water Management components of the Discharge Pilot Project.
    - The SDs will submit the draft *Discharge Pilot Project Work Plan* to the Agencies.

e) <u>Include information regarding unresolved delays encountered or anticipated that may affect the future schedule for implementation of the Work.</u>

The SDs have been working to develop alternative ways to conduct on-the-water activities that meet the objectives of the waterfowl mitigation plan. The SDs have been testing remote controlled drones for some activities, including waterfowl mitigation hazing with the sampling drone boat and other un-manned drone technology. Additional development and testing of unmanned remote controlled aerial drones and on-the-water craft continues.

f) <u>Include any modifications to the Remedial Action or Remedial Design Work Plans or other work plans or schedules that SDs have proposed to EPA or that have been approved by the EPA.</u>

The MBMG is not currently monitoring the Granite Mountain Mine shaft due to safety concerns as discussed above.

g) <u>Describe all activities undertaken in support of the Community Relations Plan during the previous quarter and those to be undertaken in the next quarter</u>

Please see the response above in Section a. *Actions taken toward achieving compliance with the CD*, *Subsection 2. Public Education and Involvement* for details to the answers of this reporting requirement.

h) <u>Issues encountered</u>

Safety concerns have led to temporary suspension of water-level monitoring at the Granite Mountain Mine shaft as discussed above.

i) EPA 5 Year Review Recommendations Status

In order to determine if the remedy is or will be protective of human health and the environment, the EPA conducts 5-year reviews of the site to evaluate the implementation and performance of the BMFOU remedy. The most recent 5-year review was completed in 2016. As part of the 5-year review, the EPA provides recommendations to address current site issues as presented in Table 14 of the *Fourth Five-Year Review Report for Silver Bow Creek/Butte Area Superfund Site, EPA ID MTD980502777, Butte, Silver Bow Deer Lodge Counties, Montana* (EPA, 2016). The EPA has requested the SDs report the status of these recommendations in the quarterly BMFOU report. The status of the follow-up actions is described in the table below.

Table 3 Recommendations to Address Current Site Issues

Issue	Recommendation/Follow-Up Action	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness?		Status
					Current	Future	
Rotational slumps have occurred at the Pit and analysis indicates there will continue to be future slumps.	Complete implementation of the recommendations required by EPA regarding the 2014/2015 slope stability study.	SDs	EPA/DEQ	09/30/2017	No	Yes	In the third quarter of 2018 Slope Stability Monitoring was conducted (see Attachment 4).
Sampling of the water in the Berkeley Pit has been limited due to safety concerns of physically being on the surface of the water.	Implement current alternatives that are being developed.	SDs	EPA/DEQ	09/30/2017	No	Yes	The SDs, with support from Montana Tech, have constructed a sampling drone boat. The sampling drone boat has been used to successfully collect water samples from the Pit since July 19, 2017, and the SDs propose to continue to use the sampling drone boat to collect Pit water samples in the future.
A portion of the Waterfowl Mitigation Plan has been modified due to safety concerns related to slope stability at the Berkeley Pit.	After implementing recommendations required by EPA regarding the 2014/2015 slope stability study, evaluate the remedy to determine any needed changes to the Waterfowl Mitigation Plan.	SDs	EPA/DEQ	09/30/2019	No	Yes	The SDs continue to test and evaluate additional methods to prevent waterfowl from landing in the Pit, and to minimize the time spent on the Pit by waterfowl that do land, based on the input and recommendations of the Waterfowl Advisory Board and other waterfowl experts. The SDs are responding to comments received from the Agencies to the *Draft Final BMFOU – Berkeley Pit Waterfowl Protection Plan* (SDs, 2018) on September 24, 2018.

j) Other

The following information is included in this report at the request of the Agencies, and is not part of the BMFOU RA.

MR continued operations during the third quarter in compliance with State-issued permits and the description in the CD that allows for the recovery of ore, crushing, concentration, leaching and the importation of water as needed for mining (*CD, Section IX. ACCESS AND INSTITUTIONAL CONTROLS, part 26b., p. 39*).

Attachment 4 is a memorandum from the third quarter titled, *Berkeley Pit Slope Stability Third Quarter Summary 2018* (MR, 2018) produced by MR's Engineering Department. The report summarizes activities conducted during the quarter related to monitoring and dewatering of the alluvium in the Concentrator, Southeast Corner and Pittsmont Sectors of the Pit.

Submission of this report does not constitute a statement by Atlantic Richfield Company or MR concerning responsibility between them for any identified tasks or a statement by Atlantic Richfield Company or MR that any specific task is required to comply with any existing agreement.

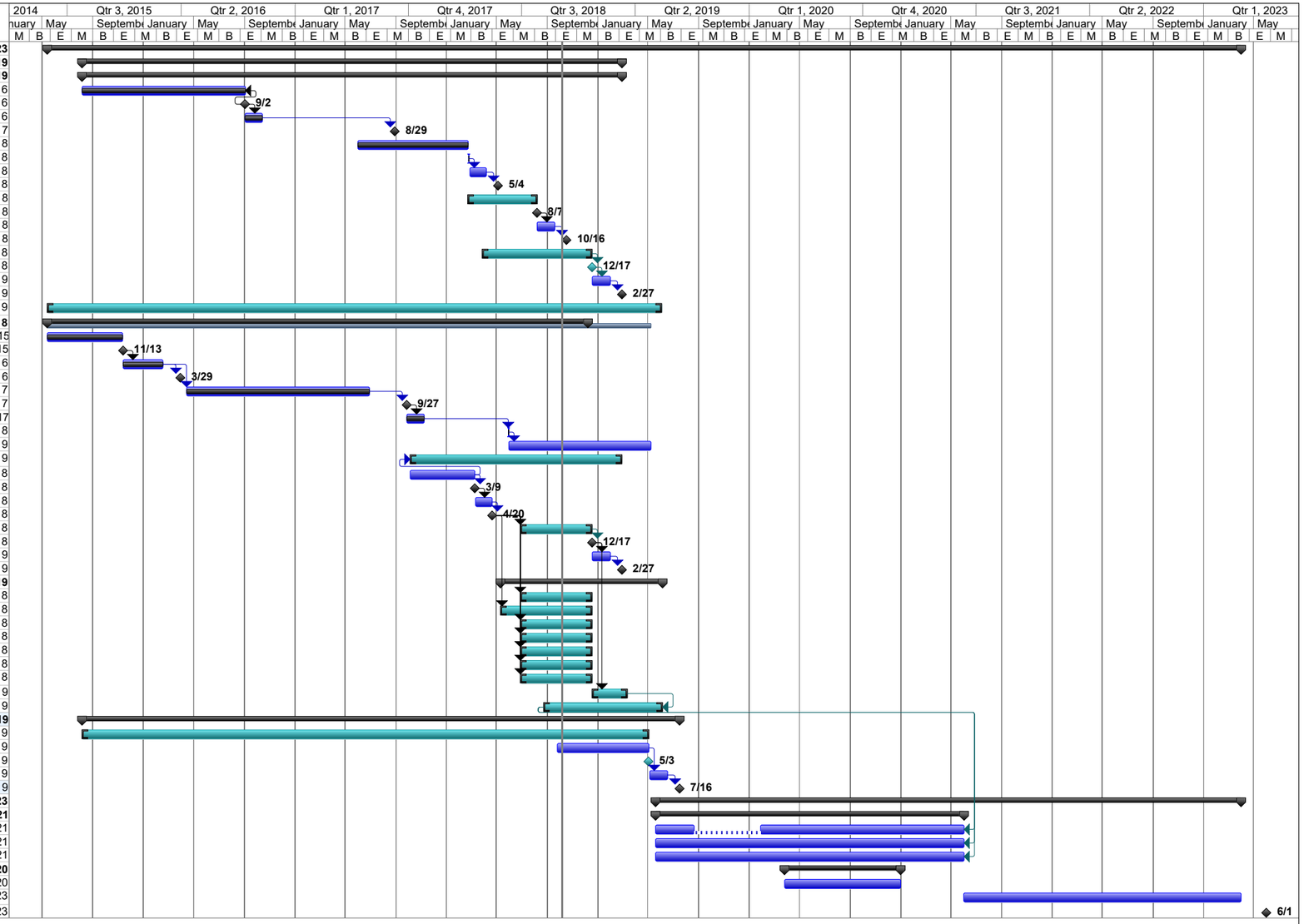
BMFOU QUARTERLY REPORT

THIRD QUARTER 2018

ATTACHMENT 1:

Revised BMFOU RAAR Schedule

ID		Task Name	Duration	Start	Finish
1		**Remedial Action Adequacy Review (RAAR)**	**2018 days**	**Thu 5/14/15**	**Fri 3/31/23**
2		**Water Management Alternatives**	**910 days**	**Thu 8/6/15**	**Wed 2/27/19**
3		**Water Balance**	**910 days**	**Thu 8/6/15**	**Wed 2/27/19**
4	✓	Phase 1 Work Plan Development	276 days	Thu 8/6/15	Fri 9/2/16
5	✓	Issue Draft Work Plan to Agencies	0 days	Fri 9/2/16	Fri 9/2/16
6	✓	Agency Review	29 days	Fri 9/2/16	Thu 10/13/16
7	✓	Issue Final Phase 1 Work Plan	0 days	Tue 8/29/17	Tue 8/29/17
8	✓	Develop Phase 1 Water Balance	185 days	Thu 6/1/17	Wed 2/21/18
9	✓	Issue Draft RAAR Water Balance Tech Memo to Agencies	1 day	Fri 2/23/18	Fri 2/23/18
10		Agency Review	30 days	Mon 2/26/18	Fri 4/6/18
11		Issue Final RAAR Water Balance Tech Memo	0 days	Fri 5/4/18	Fri 5/4/18
12		Phase 2 Work Plan Development	118 days	Wed 2/21/18	Tue 8/7/18
13		Issue Draft Work Plan to Agencies	0 days	Tue 8/7/18	Tue 8/7/18
14		Agency Review	30 days	Tue 8/7/18	Tue 9/18/18
15		Issue Final Phase 2 Work Plan	0 days	Tue 10/16/18	Tue 10/16/18
16		Develop Phase 2 Water Balance	185 days	Wed 3/28/18	Mon 12/17/18
17		Issue Draft RAAR Phase 2 Water Balance Tech Memo to Agencies	1 day	Mon 12/17/18	Mon 12/17/18
18		Agency Review	30 days	Tue 12/18/18	Wed 1/30/19
19		Issue Final RAAR Phase 2 Water Balance Tech Memo	0 days	Wed 2/27/19	Wed 2/27/19
20		**RAAR HsBWTP O&M Optimization**	1036 days	Thu 5/14/15	Mon 6/3/19
21		**HsBWTP Phase 1 Short Term Optimization**	**913 days**	**Thu 5/14/15**	**Fri 12/7/18**
22	✓	Phase 1 Work Plan Development	128 days	Thu 5/14/15	Wed 11/11/15
23	✓	Issue Draft Work Plan to Agencies	0 days	Fri 11/13/15	Fri 11/13/15
24	✓	Agency Review	65 days	Fri 11/13/15	Tue 2/16/16
25	✓	Issue Final Phase 1 Work Plan	0 days	Tue 3/29/16	Tue 3/29/16
26	✓	Develop Hydraulic Model and Process Evaluation	310 days	Thu 4/14/16	Wed 6/28/17
27	✓	Issue Draft RAAR HsBWTP Pase 1 Optimization Tech Memo to Agencies	0 days	Wed 9/27/17	Wed 9/27/17
28	✓	Agency Review	30 days	Wed 9/27/17	Tue 11/7/17
29	✓	Issue Final RAAR HsBWTP Phase 1 Optimization Tech Memo	1 day	Wed 5/30/18	Wed 5/30/18
30		HsBWTP Optimization Improvements	240 days	Thu 5/31/18	Wed 5/8/19
31		**HsBWTP Phase 2 Optimization Evaluation**	356 days	Thu 10/5/17	Wed 2/27/19
32		Phase 2 Work Plan Development	109 days	Thu 10/5/17	Fri 3/9/18
33		Issue Draft Work Plan to Agencies	0 days	Fri 3/9/18	Fri 3/9/18
34		Agency Review	30 days	Mon 3/12/18	Fri 4/20/18
35		Issue Final Phase 2 Work Plan	0 days	Fri 4/20/18	Fri 4/20/18
36		Develop Hydraulic Model and Process Design	120 days	Thu 6/28/18	Mon 12/17/18
37		Issue Draft RAAR HsBWTP Pase 2 Optimization Tech Memo to Agencies	0 days	Mon 12/17/18	Mon 12/17/18
38		Agency Review	30 days	Tue 12/18/18	Wed 1/30/19
39		Issue Final RAAR HsBWTP Phase 2 Optimization Tech Memo	0 days	Wed 2/27/19	Wed 2/27/19
40		**Water Treatment Design Review (Phase 2 HsBWTP Opt. Eval. Tech Memo)**	**272 days**	**Fri 5/11/18**	**Wed 6/5/19**
41		Alternatives Evaluation	120 days	Thu 6/28/18	Mon 12/17/18
42		Pilot Studies	153 days	Fri 5/11/18	Mon 12/17/18
43		Performance Testing (incl. WET testing)	120 days	Thu 6/28/18	Mon 12/17/18
44		Evaluation of Cd treatment requirements	120 days	Thu 6/28/18	Mon 12/17/18
45		Evaluation for the need for acidification	120 days	Thu 6/28/18	Mon 12/17/18
46		Evaluation of scaling in discharge waters	120 days	Thu 6/28/18	Mon 12/17/18
47		Sludge Disposal/Repository Evaluation	120 days	Thu 6/28/18	Mon 12/17/18
48		Current Design Review Tech Memo	59 days	Tue 12/18/18	Tue 3/12/19
49		Design Report (Preliminary, Draft Final, Final)	200 days	Thu 8/23/18	Wed 6/5/19
50		**Final RAAR Tech Memo**	**1007 days**	**Thu 8/6/15**	**Tue 7/16/19**
51		Water Management Alternatives	957 days	Thu 8/6/15	Fri 5/3/19
52		Prepare Final RAAR Tech Memo	156 days	Tue 9/25/18	Fri 5/3/19
53		Issue Draft Final RAAR Tech Memo to Agencies	0 days	Fri 5/3/19	Fri 5/3/19
54		Agency Review	30 days	Mon 5/6/19	Mon 6/17/19
55		Issue Final RAAR Tech Memo	0 days	Tue 7/16/19	Tue 7/16/19
56		**HsBWTP Upgrades Implementation (Including Shakedown Period)**	**992 days**	**Mon 5/20/19**	**Fri 3/31/23**
57		**HsBWTP Upgrades (Construction)**	**520 days**	**Mon 5/20/19**	**Tue 6/1/21**
58		Upgrades (incl. polishing)	410 days	Mon 5/20/19	Tue 6/1/21
59		Acidification	520 days	Mon 5/20/19	Tue 6/1/21
60		Pump Station and Piping	520 days	Mon 5/20/19	Tue 6/1/21
61		**Sludge Disposal Modifications (if necessary)**	**196 days**	**Thu 3/26/20**	**Wed 12/30/20**
62		Construction (if necessary)	196 days	Thu 3/26/20	Wed 12/30/20
63		Shakedown Period of Operations	473 days	Tue 6/1/21	Fri 3/31/23
64		East Camp Bedrock CWL Prediction (2016)	0 days?	Thu 6/1/23	Thu 6/1/23



Montana Resources

Atlantic Richfield Company

DRAFT BMFOU RAAR SCHEDULE

Project: RAAR Schedule Update 0303
Date: Sun 10/7/18

Task	Summary	External Milestone	Inactive Summary	Manual Summary Rollup	Finish-only			
Split	Project Summary	Inactive Task	Manual Task	Manual Summary	Progress			
Milestone	External Tasks	Inactive Milestone	Duration-only	Start-only	Deadline			

BMFOU QUARTERLY REPORT

THIRD QUARTER 2018

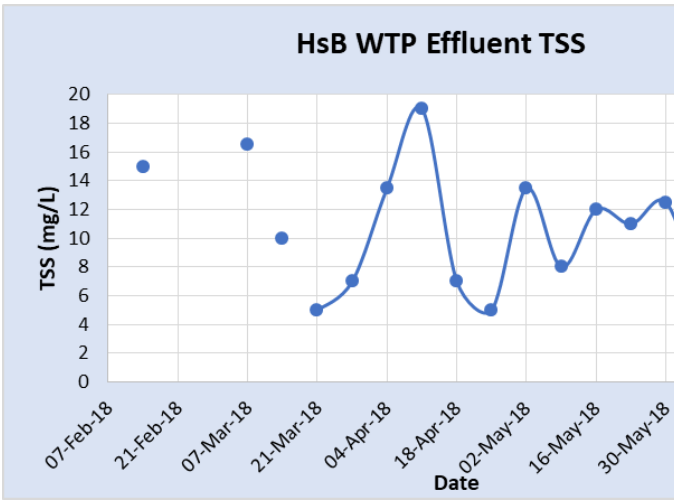
ATTACHMENT 2:

HsBWTP O&M Short Term Optimization Recommendations Status

No.	Recommendation	Description	Purpose	Priority	Report Section
1	Install coupons.	Install hot-tapped corrosion coupons at strategic locations in HsBWTP.	To provide objective metric (i.e., weight gain) to assess process performance (e.g., SRR).	High	3.6
		Status	Scale coupons installed in alkalization tank, reactor, and clarifier in both stage one and stage 2. Coupons were installed in November and are pulled, weighed, and cleaned every week to established baseline scaling information.		
2	Modify EQ basin operation.	Allow level to fluctuate to attenuate variations in flow.	To provide a more consistent feed to the HsBWTP.	High	4.1
		Status	Allow the level to fluctuate between 40% and 60% before making adjustments to flow.		
3	Improve first- and second-stage pH adjustment reactors' mixing.	Replace radial mixers with axial flow mixers (in progress).	To provide completely mixed tank contents.	High	4.4.2 4.4.6
		Status	1st stage mixer was replaced and was started up on 6/15/18. Replacement of 2nd stage reactor mixer was completed on		

No.	Recommendation	Description	Purpose	Priority	Report Section
			8/01/18. Air line for 1st stage mixer came loose from its support and the line was temporarily removed. This resulted in the mixer running without air from 6/26/18 to 9/5/18.		
4	Increase polymer aging time.	Increase polymer concentration to extend aging time.	Increased aging allows polymer molecule to uncoil, exposing more active sites.	Medium	4.4.9
		Status	The concentration has been increased from 0.11% to 0.16%. Motors are pulling about 4.5 amps at this concentration and the overload protection is set at 4.9 amps. We are working with the supplier to determine what modifications are needed for higher polymer concentration.		
5	Replace polymer mixer motor.	Install larger motors that can accommodate higher loads from more concentrated polymer solution.	Larger mixer motor to address electrical load from increased viscosity.	Medium	4.4.9
		Status	Same as above.		
6	Troubleshoot first-stage air flow meter.	Ensure accurate air flow to first stage, especially.	Optimize aeration to achieve iron removal.	High	4.4.5
		Status	The flowmeter was replaced in December and is reading between 600 – 800 scfm, similar to the flow rates of the stage II meter.		
7	Adopt target for TSS in first- and second-stage pH adjustment reactors.	Establish TSS targets in first- and second-stage pH adjustment reactors to control SRR.	Simplify operational control of SRR.	High	4.6
		Status	TSS has been monitored along with scale coupons since November 2017. The results show a slight reduction in scale accumulation at higher TSS.		
8	Inspect influent and effluent pumps and piping.	Determine if scaling or other issues causing pumps to not achieve design pressure and flow.	Investigate key hydraulic limitations to achieving HsBWTP design flow rate.	Medium	5.2.1
		Status	Influent and effluent wet well inspected and found significant solid accumulation. Influent wet well was cleaned and new pump installed. Initially pump could produce higher flows but flow has since degraded. Effluent wet well will be cleaned in October. Anticipate overflow to the Berkeley Pit for		

No.	Recommendation	Description	Purpose	Priority	Report Section
			approximately 5 days during cleanout.		
9	Test pumps following inspection.	Determine if pumps operating on design curve.	Establish pump capability to achieve design pressure and flow.	Medium	5.2.1
		Status	A single influent pump could pump 4,400 gpm after cleaning wet well and installing a new pump. Flow has since degraded and pump P-115 can only pump 3,320 gpm.		
10	Remove upwell baffles.	Replace existing baffles with larger, shorter baffles.	Minimize hydraulic limitation.	High	6.2
		Status	The reactors will be monitored to determine if the new mixers will prevent soilds from accumulating at the opening to the upwell. If this improvement plus raising the reactor launder side wall height is not sufficient to eliminate the hydraulic bottleneck, then removal of the upwell baffles will be investigated.		
11	Increase reactor launder side wall height.	Increase cross-sectional area.	Avoid launder overtopping at elevated flow rates.	Medium	5.2.4
		Status	Reactor launder side wall height was increased during the first stage clean-out in June of 2018.		
12	Evaluate increased HRT.	Operate HsBWTP in parallel single-stage mode.	Objectively determine if increased HRT improves performance.	High	4.4 4.6 6.1
		Status	HRT will be preliminarily evaluated by monitoring scale coupons at different feed rates. Further evaluation will be completed in pilot testing.		
13	Revise SRR calculation method.	Evaluate lime feed rate as control variable to SRR pump rate (each stage).	Automate SRR flow to already trended variable.	Medium	4.6
		Status	Lime feed rate is not specific for each stage. A mass balance calculation is currently being used to track the SRR.		
14	Conduct frequent jar testing of polymer performance.	Assess proper polymer dosage in laboratory.	Verify polymer use by laboratory testing.	High	4.4.9
		Status	Jar testing is conducted once per week or when conditions change.		

No.	Recommendation	Description	Purpose	Priority	Report Section
15	Repair “windows” in clarifier center tube.	Patch holes cut into clarifier (temporary).	Obviate potential for solids to short circuit.	Low	4.4.4 4.4.8 6.1
		Status	We will evaluate after polymer system optimization.		
16	Install jet mix diffuser for polymer feed.	Replace hydraulic jump mixing with jet mixing.	Improve polymer addition, improve clarification.	High	4.4.3 4.4.7 6.1
		Status	Polymer addition location was changed in the first stage from the hydraulic jump to immediately before the clarifier center well. There was visual improvement in the clarifier and jar tests. Effluent TSS has been monitored since 2/14/18 and all results have been below the discharge standard of 20 mg/l for a monthly average. Therefore, this recommended modification is not needed. 		
17	Remove scale from reactor launder more frequently.	Descale reactor launder more often than plant-wide descaling.	Improve launder hydraulics, avoid overtopping at elevated flow.	High	6.2
		Status	This recommendation may not be implemented. Scale accumulation did not cause a bottleneck in the system until mid-April, which was about 1 month before the scheduled annual cleanout. At this point the influent flow was limited to 5.2 MGD. The increase launder side wall height (recommendation 11) that was implemented in the clean-out should further reduce the impacts of scale accumulation.		

BMFOU QUARTERLY REPORT

THIRD QUARTER 2018

ATTACHMENT 3:

Horseshoe Bend Water Treatment Plant
Groundwater Level Reduction Project Quarterly Report

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www.montanaresources.com

MEMORANDUM

TO: Mark Thompson

FROM: Amanda Griffith

DATE: **November 2, 2018**

SUBJECT: **HsBWTP GWL Reduction-2018 3rd Quarter Summary**

Overview

The Horseshoe Bend groundwater dewatering system was operated almost continuously through the third quarter of 2018, with an operational efficiency of approximately 99.9%. There was one brief shutdown of pumping wells related to a power outage. Flow rates can be seen in Table 1, and locations of the wells around the plant can be seen in Figure 1. Water levels and pumping rates were monitored weekly to determine their effect on the dewatering of the area.

Changes in water level over the second quarter can be seen in Table 2.

No new monitor wells were installed during the third quarter. The pumping rate in well H15-7 is slowing down; this will be monitored to determine if the well should be developed and the pump and motor replaced. The Static Water Level (SWL) and Pumping Water Level (PWL) elevations of all wells can be seen in Table 2. A graphical plot of the elevations can be seen in Figure 2.

Table 1. Pumping rates for HsBWTP dewatering wells for the 3rd quarter of 2018.

All Elevations ACM	H14-1		H14-2		H14-3		H14-4		H14-5		H14-6	
	Ground Level	5632.25	Ground Level	5631.02	Ground Level	5614.91	Ground Level	5618.0	Ground Level	5617.1	Ground Level	5631
	water level	water	water level	water	water level	water	water level	water	water level	water	water level	water
Date	below MP	elevation	below MP	elevation	below MP	elevation	below MP	elevation	below MP	elevation	below MP	elevation
6/29/2018	41.6	5593.00	43.27	5590.20	41.66	5575.20	31.81	5588.30	67.25	5551.85	69.93	5563.25
7/5/2018	41.66	5592.94	43.24	5590.23	41.83	5575.03	31.92	5588.19	67.54	5551.56	70.14	5563.04
7/11/2018	41.68	5592.92	43.24	5590.23	41.80	5575.06	31.92	5588.19	67.34	5551.76	70.05	5563.13
7/18/2018	41.70	5592.90	43.32	5590.15	41.88	5574.98	32.00	5588.11	67.34	5551.76	70.08	5563.10
7/25/2018	41.78	5592.82	43.24	5590.23	41.99	5574.87	31.95	5588.16	67.43	5551.67	70.09	5563.09
8/1/2018	41.81	5592.79	43.17	5590.30	41.62	5575.24	32.01	5588.10	67.30	5551.80	70.06	5563.12
8/8/2018	41.94	5592.66	43.20	5590.27	42.09	5574.77	32.08	5588.03	67.45	5551.65	70.10	5563.08
8/15/2018	42.07	5592.53	43.32	5590.15	42.12	5574.74	32.20	5587.91	67.42	5551.68	70.10	5563.08
8/23/2018	42.08	5592.52	43.35	5590.12	42.10	5574.76	32.29	5587.82	67.33	5551.77	70.07	5563.11
8/29/2018	42.24	5592.36	43.34	5590.13	42.20	5574.66	32.33	5587.78	67.41	5551.69	70.18	5563.00
9/5/2018	42.36	5592.24	43.32	5590.15	42.43	5574.43	32.45	5587.66	67.68	5551.42	70.32	5562.86
9/12/2018	42.41	5592.19	43.40	5590.07	42.38	5574.48	32.44	5587.67	67.40	5551.70	70.23	5562.95
9/19/2018	41.91	5592.69	43.38	5590.09	42.51	5574.35	32.51	5587.60	67.61	5551.49	70.20	5562.98
9/26/2018	41.85	5592.75	43.37	5590.10	42.62	5574.24	32.59	5587.52	67.72	5551.38	70.40	5562.78
10/3/2018	41.83	5592.77	43.48	5589.99	42.63	5574.23	32.64	5587.47	67.80	5551.30	70.31	5562.87

All Elevations ACM	H15-7		H15-8		H15-9		H15-10		H15-11		H15-12	
	Ground Level	5631.5	Ground Level	5629.47	Ground Level	5631.64	Ground Level	5620.41	Ground Level	5622.84	Ground Level	5631.6
	water level	water	water level	water	water level	water	water level	water	water level	water	water level	water
Date	below MP	elevation	below MP	elevation	below MP	elevation	below MP	elevation	below MP	elevation	below MP	elevation
6/29/2018	31.53	5600.24	32.82	5598.94	25.08	5609.35	40.22	5582.78	34.09	5591.76	25.86	5607.48
7/5/2018	31.65	5600.12	32.85	5598.91	25.2	5609.23	39.68	5583.32	34.02	5591.83	26.21	5607.13
7/11/2018	31.67	5600.10	32.82	5598.94	25.17	5609.26	40.16	5582.84	33.97	5591.88	26.31	5607.03
7/18/2018	31.67	5600.10	32.85	5598.91	25.25	5609.18	40.20	5582.80	34.73	5591.12	26.66	5606.68
7/25/2018	31.68	5600.09	32.88	5598.88	25.32	5609.11	40.19	5582.81	34.70	5591.15	26.60	5606.74
8/1/2018	31.68	5600.09	32.87	5598.89	25.40	5609.03	40.12	5582.88	34.28	5591.57	27.01	5606.33
8/8/2018	31.65	5600.12	32.87	5598.89	25.46	5608.97	40.17	5582.83	35.01	5590.84	27.51	5605.83
8/15/2018	31.66	5600.11	32.87	5598.89	25.54	5608.89	40.19	5582.81	35.04	5590.81	27.92	5605.42
8/23/2018	31.55	5600.22	32.85	5598.91	25.65	5608.78	40.22	5582.78	35.21	5590.64	28.32	5605.02
8/29/2018	31.48	5600.29	32.82	5598.94	25.72	5608.71	40.19	5582.81	35.43	5590.42	28.65	5604.69
9/5/2018	31.47	5600.30	32.80	5598.96	25.84	5608.59	40.19	5582.81	36.17	5589.68	29.08	5604.26
9/12/2018	31.22	5600.55	32.75	5599.01	25.92	5608.51	40.19	5582.81	35.89	5589.96	29.13	5604.21
9/19/2018	18.95	5612.82	32.80	5598.96	24.96	5609.47	40.19	5582.81	34.94	5590.91	28.53	5604.81
9/26/2018	16.52	5615.25	32.75	5599.01	23.97	5610.46	40.18	5582.82	34.13	5591.72	26.89	5606.45
10/3/2018	14.28	5617.49	32.79	5598.97	23.22	5611.21	40.18	5582.82	33.50	5592.35	25.64	5607.70

Table 2 (cont.). Pumping rates for HsBWTP dewatering wells for the 2nd quarter of 2018.

All Elevations ACM	H16-13		H16-14		H18-15		H18-16		H18-17		H18-18	
Date	water level below MP	water elevation	water level below MP	water elevation	water level below MP	water elevation	water level below MP	water elevation	water level below MP	water elevation	water level below MP	water elevation
6/29/2018	21.84	5609.60	26.04	5598.81	22.46	5603.76	26.32	5592.73	26.33	5608.75	25.84	5591.76
7/5/2018	21.89	5609.55	26.15	5598.7	22.8	5603.42	26.43	5592.62	26.4	5608.68	25.93	5591.67
7/11/2018	21.88	5609.56	26.00	5598.85	22.61	5603.61	26.42	5592.63	26.43	5608.65	25.95	5591.65
7/18/2018	21.98	5609.46	26.05	5598.8	22.61	5603.61	26.49	5592.56	26.50	5608.58	26.00	5591.60
7/25/2018	22.02	5609.42	26.08	5598.77	22.53	5603.69	26.52	5592.53	26.54	5608.54	26.03	5591.57
8/1/2018	22.07	5609.37	26.08	5598.77	22.64	5603.58	26.54	5592.51	26.59	5608.49	26.03	5591.57
8/8/2018	22.17	5609.27	26.20	5598.65	22.78	5603.44	26.60	5592.45	26.65	5608.43	26.10	5591.50
8/15/2018	22.24	5609.20	26.22	5598.63	22.87	5603.35	26.66	5592.39	26.70	5608.38	26.14	5591.46
8/23/2018	22.28	5609.16	26.28	5598.57	22.99	5603.23	26.75	5592.30	26.81	5608.27	26.21	5591.39
8/29/2018	22.45	5608.99	26.36	5598.49	23.10	5603.12	26.80	5592.25	26.89	5608.19	26.89	5590.71
9/5/2018	22.46	5608.98	26.43	5598.42	23.05	5603.17	26.85	5592.20	26.97	5608.11	26.46	5591.14
9/12/2018	22.43	5609.01	26.42	5598.43	23.14	5603.08	26.90	5592.15	27.06	5608.02	26.43	5591.17
9/19/2018	22.31	5609.13	26.58	5598.27	23.24	5602.98	26.91	5592.14	27.04	5608.04	26.43	5591.17
9/26/2018	22.26	5609.18	26.80	5598.05	23.25	5602.97	26.90	5592.15	26.93	5608.15	26.44	5591.16
10/3/2018	22.25	5609.19	26.35	5598.5	23.21	5603.01	26.71	5592.34	26.77	5608.31	26.24	5591.36

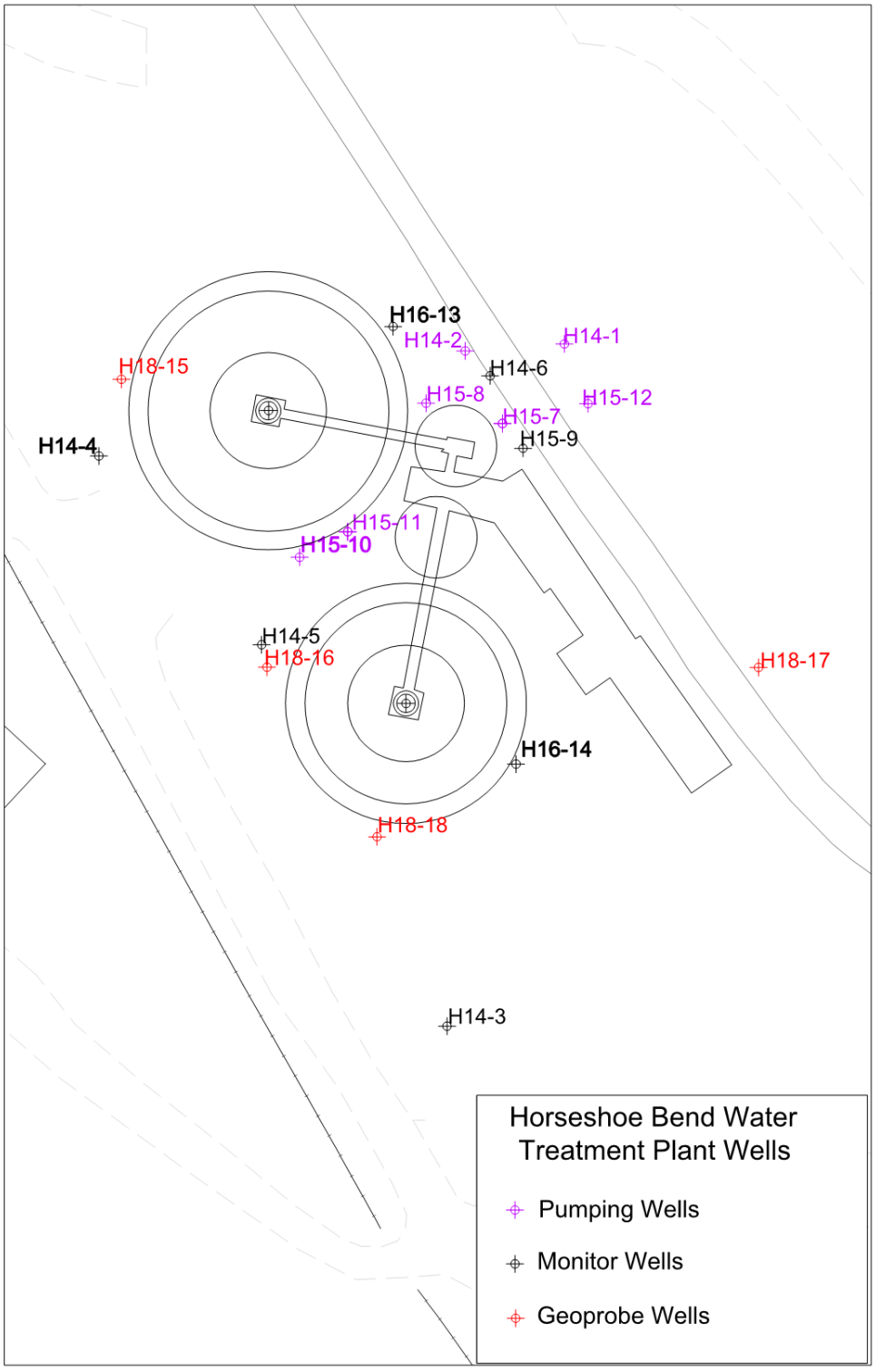

Figure 1. Site map of HsBWTP and surrounding dewatering and monitor wells.

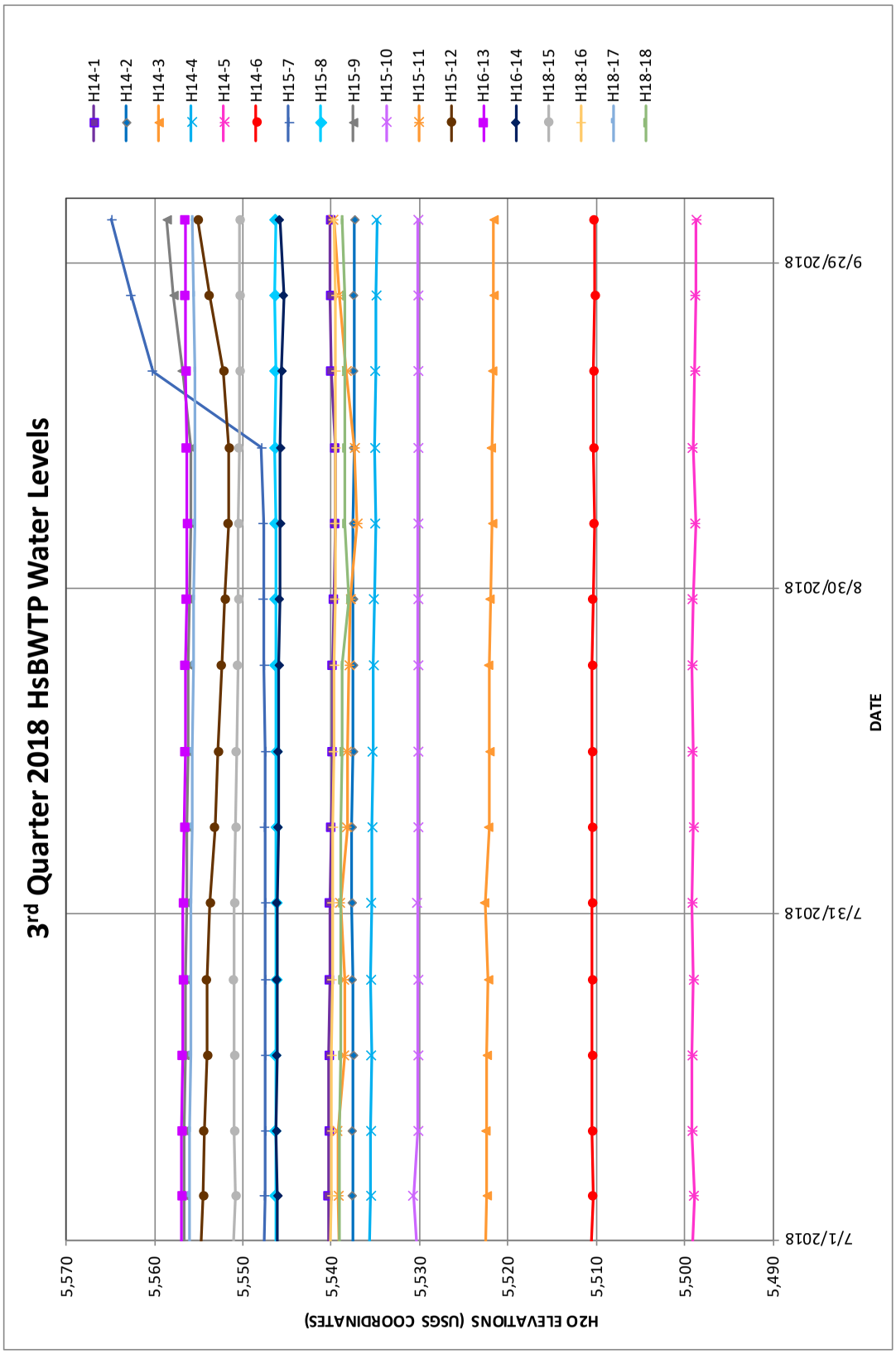

Figure 2. HsBWTP dewatering and monitor well levels for 3rd quarter of 2018.

Table 2. PWLs and SWLs of the HsBWTP dewatering and monitor wells 7/5/2018 through 9/26/2018.

Well	9/26/2018 Water elevation (USGS ft)	9/26/2018 Water elevation (ACM ft)	Change from 7/5/2018 (ft)	Screened interval (ACM ft)
H14-1*	5540.12	5592.75	-0.19	5562-5582
H14-2*	5537.47	5590.10	-0.13	5561-5581
H14-3*	5521.61	5574.24	-0.79	5555-5575
H14-4*	5534.89	5587.52	-0.67	5538-5558
H14-5**	5498.75	5551.38	-0.18	5515-5535
H14-6**	5510.15	5562.78	-0.26	5535-5555
H15-7*	5562.62	5615.25	15.13	5593-5623
H15-8*	5546.38	5599.01	0.10	5592-5602
H15-9	5557.83	5610.46	1.23	5597-5507
H15-10*	5530.19	5582.82	-0.50	5572-5592
H15-11*	5539.09	5591.72	-0.11	5576-5596
H15-12*	5553.82	5606.45	-0.68	5582-5612
H16-13	5556.55	5609.18	-0.37	5579-5599
H16-14	5545.42	5598.05	-0.65	5579-2289

*** Pumping well**

**** No longer pumping**

Table 3. PWLs and SWLs of the HsBWTP Geoprobe monitor wells 7/5/2018 through 9/26/2018.

Well	9/26/2018 Water elevation (USGS ft)	9/26/2018 Water elevation (ACM ft)	Change from 7/5/2018 (ft)	Screened interval (ACM ft)
H18-15	5550.34	5602.97	-0.38	5562-5582
H18-16	5539.52	5592.15	-0.24	5561-5581
H18-17	5555.52	5608.15	-0.23	5555-5575
H18-18	5538.53	5591.16	-0.30	5538-5558

BMFOU QUARTERLY REPORT

THIRD QUARTER 2018

ATTACHMENT 4:

Berkeley Pit Slope Stability Third Quarter Summary 2018

Montana Resources, LLP
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(406) 723-9542 fax
www.montanaresources.com

MEMORANDUM

TO: Stephen Walsh

FROM: Mike Harvie

COPY: Mark Thompson, MR; Tim Hilmo, ARCO/BP

DATE: October 5, 2018

SUBJECT: **Berkeley Pit Slope Stability Third Quarter Summary 2018**

Summary

Monitoring of the Berkeley Pit highwall slope stability continued throughout the Third Quarter of 2018. The monitoring network is illustrated in Plate I and summarized in Table 1.

Table 1. Berkeley monitoring network Third Quarter 2018.

BERKELEY PIT HIGHWALL STABILITY	Monitor Points & Prisms	Extensometers	Inclinometers	TDR Cables	Dewatering Pumps	Water Levels
Bird Watch Sector	**4**	**-**	**-**	**1**	**-**	**1**
Concentrator Sector	**3**	**3**	**-**	**3**	**-**	**5**
Southeast Sector	**8**	**3**	**3**	**-**	**6**	**11**
Pittsmont Sector	**3**	**-**	**-**	**4**	**-**	**3**

Monitoring

The monitoring network was maintained throughout the quarter and repairs, replacements, and adjustments were completed promptly, as needed, to provide for continued coverage.

MR's monitoring schedule is as follows:

1. Survey all monitoring points in all sectors weekly,
2. Check and read extensometers in all sectors weekly,
3. Read Time Domain Reflectometry (TDR) wells in every sector bi-monthly,
4. Visually inspect the Southeast and Concentrator Sectors weekly,
5. Measure water levels in TDRs, dewatering wells, and inclinometer wells weekly, and
6. Read inclinometers bi-monthly.

Berkeley Pit - Active Sectors

Sector nomenclature for the Berkeley Pit is detailed on Plate II (attached).

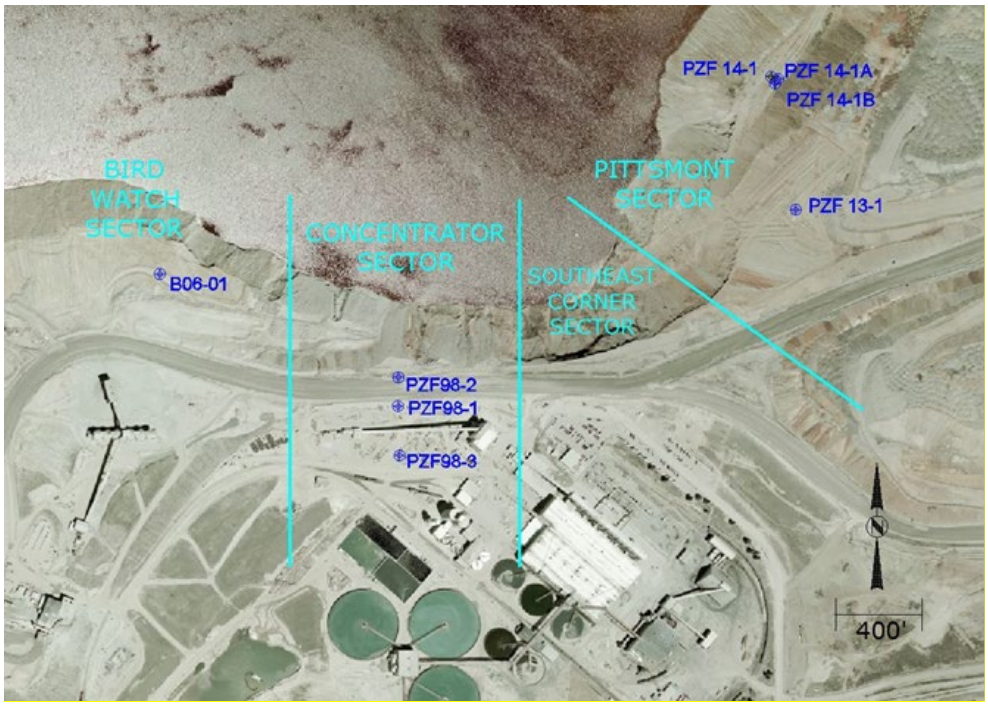


Figure 1. TDR Well locations.

Bird Watch Sector: The Bird Watch Sector monitor points did not exhibit significant movement during the Third Quarter of 2018.

Slow displacement of the outer portion of the dump continues at a rate of less than 0.5 inches per month. The TDR cable in Well B06-01 did not demonstrate any progressive distress during this period.

Concentrator Sector: Monitor points were checked in this sector throughout the quarter with no significant movement being indicated.

There was no significant movement indicated by the wire extensometers in the Concentrator Sector during the quarter.

TDR cable readings did not demonstrate any significant movement during the quarter.

Southeast Sector: The Southeast Sector monitor points did not show any significant movement during the Third Quarter of 2018.

There was no significant movement indicated by the wire extensometers in the Southeast Sector during the quarter. There were three alarm events for Extensometer A37450 during this quarter, but upon site investigation and verification of readings no significant movement was evident. Alarm settings need to be reviewed and reset to indicate future movement from current readings.

Dewatering pumps in the Southeast Sector of the Berkeley Pit continued to operate throughout the Third Quarter of 2018. The pumps installed in PZF15-1 and PZF15-6 did not operate during the entire quarter due to low water levels. The pump installed in PZF15-2 encountered mechanical problems during the August time period, which was corrected and pumping resumed. PZF15-3 lost a pump motor on August 29th, with the motor being changed out on August 30th and pumping resumed later that day.

Table 2. Average flows for the Dewatering Wells (Third Quarter 2018).

Dewatering Wells	July		August		September		Third Quarter 2018	
	Flow (gpm)	Availability	Flow (gpm)	Availability	Flow (gpm)	Availability	Flow (gpm)	Availability
PZF15-1	0.0	0%	0.0	0%	0.0	0%	0.0	0%
PZF15-2	26.8	99%	26.9	100%	26.5	100%	26.7	100%
PZF15-3	96.1	100%	96.2	97%	94.1	99%	95.5	99%
PZF15-4	10.5	100%	11.2	100%	11.7	100%	11.1	100%
PZF15-5	24.2	100%	24.3	100%	24.4	100%	24.3	100%
PZF15-6	0.0	0%	0.0	0%	0.0	0%	0.0	0%
LP-15	22.2	100%	21.9	100%	21.7	100%	21.9	100%

Pittsmont Sector: Prisms on the Pittsmont dump were surveyed once a week during the quarter. No slope movements were detected during the quarter.

The TDR cables were read bi-monthly during the quarter with no indicated distress.

Hydrographs

Water levels are tracked in all sectors. Hydrographs detailing the piezometric surface in each sector are provided in Figures 2 through 6. There were no unexpected water fluctuations of note during the quarter. Figure 5 shows the piezometric surface in PZF15-2 elevated in late August due to mechanical problems with the pump. Piezometric surface returned to its previous elevations in the well as soon as pumping resumed.

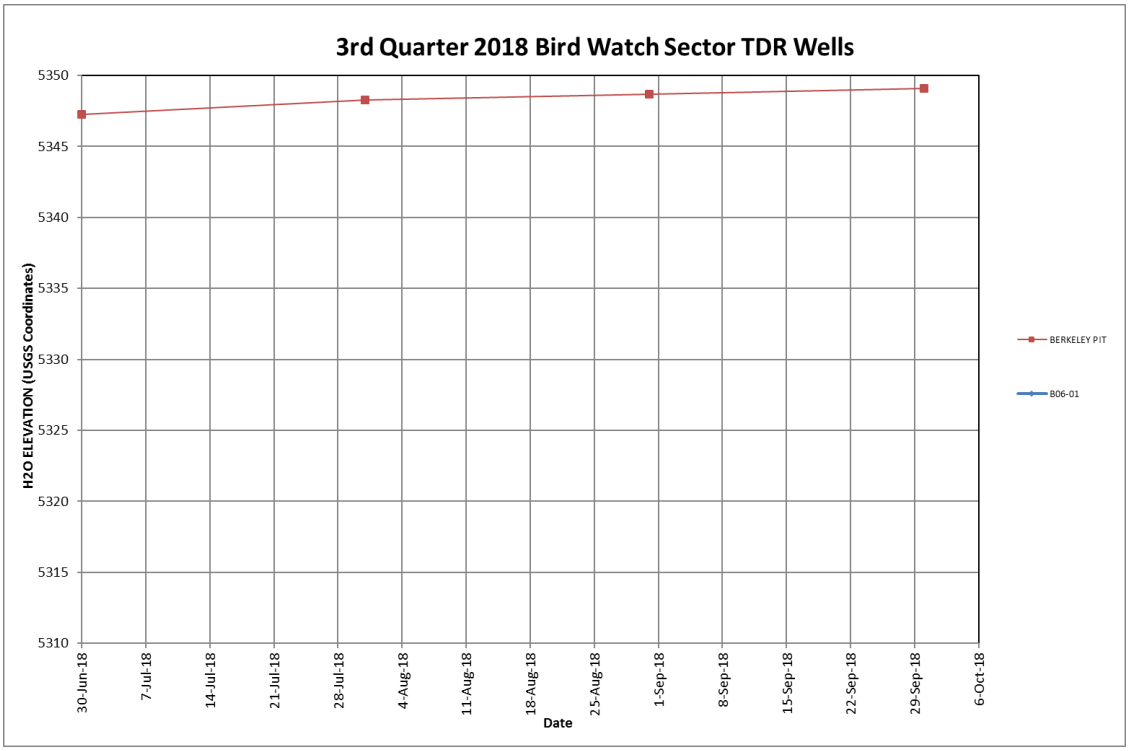


Figure 2. Hydrographs Bird Watch Sector.

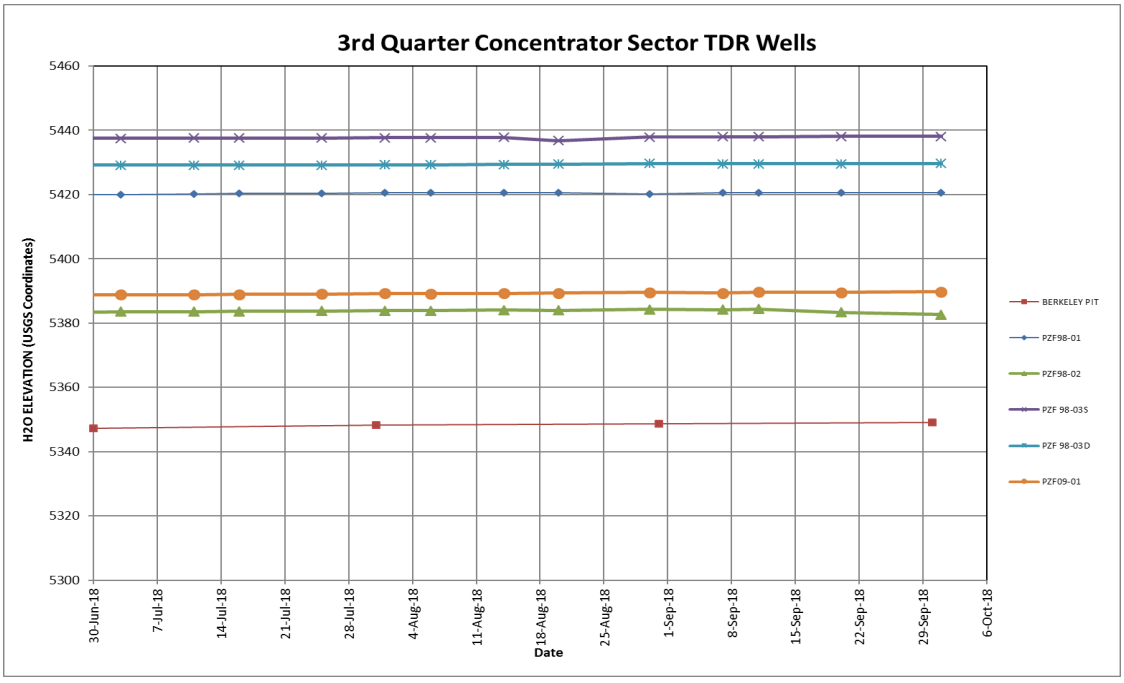


Figure 3. Hydrographs Concentrator Sector.

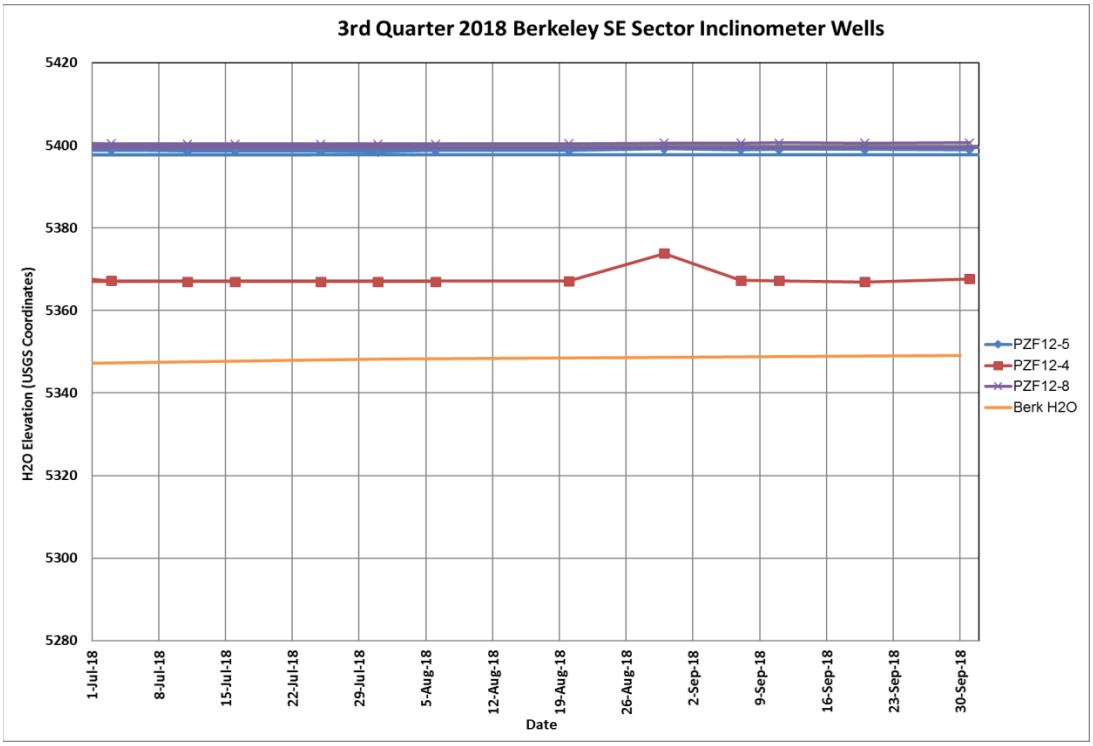


Figure 4. Hydrographs Southeast Sector inclinometer wells.

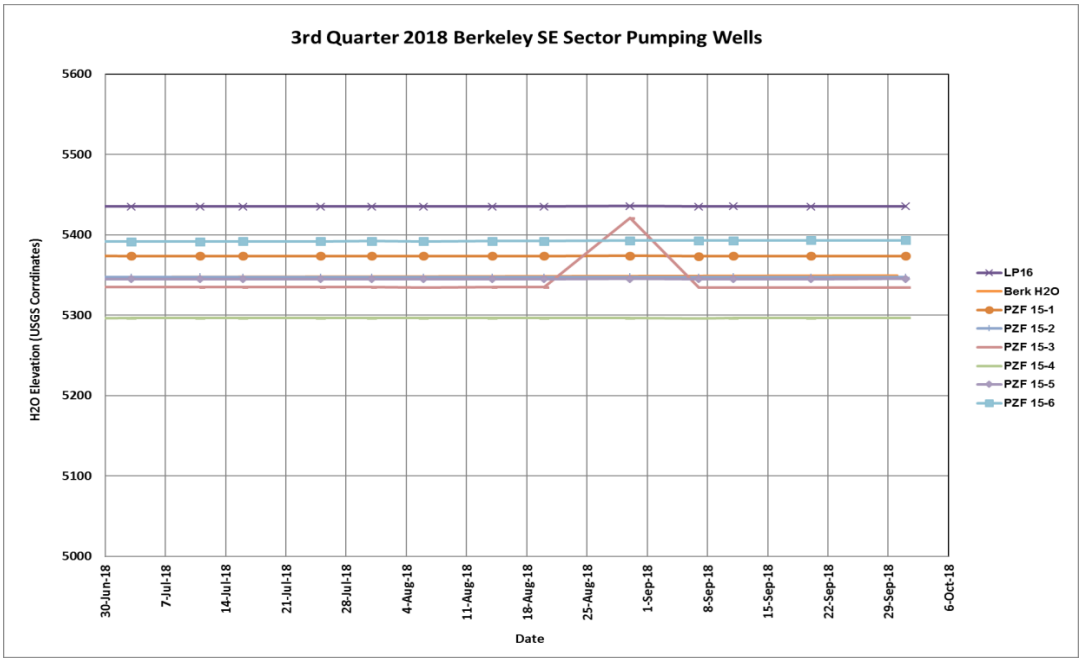


Figure 5. Hydrographs Southeast Sector pumping wells

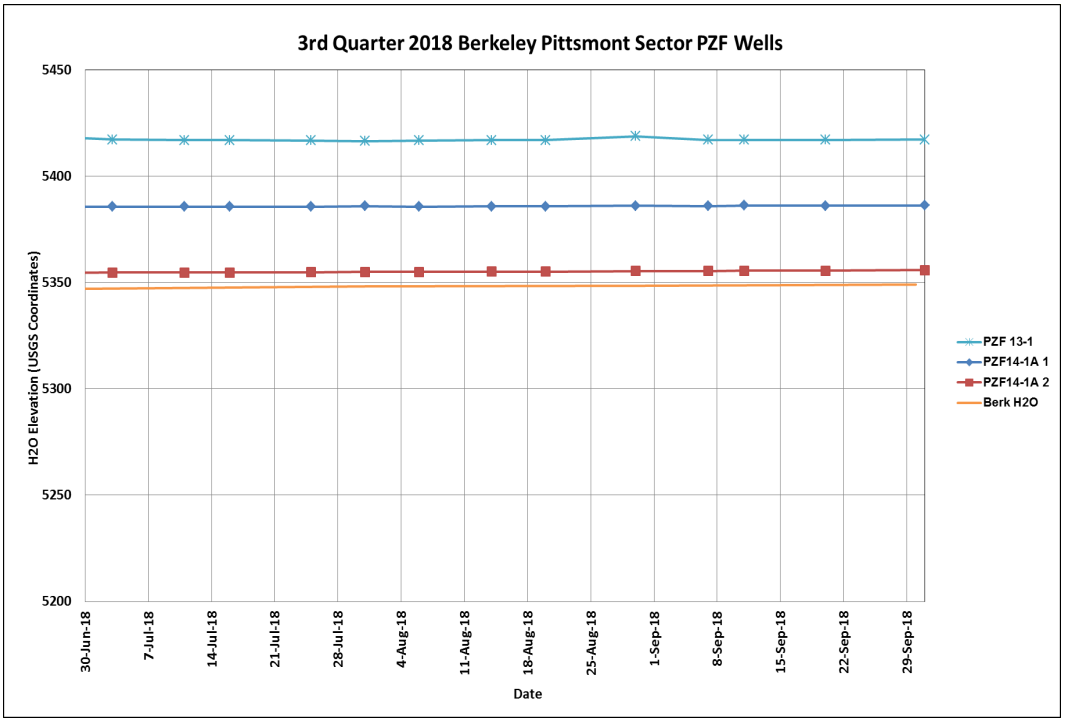
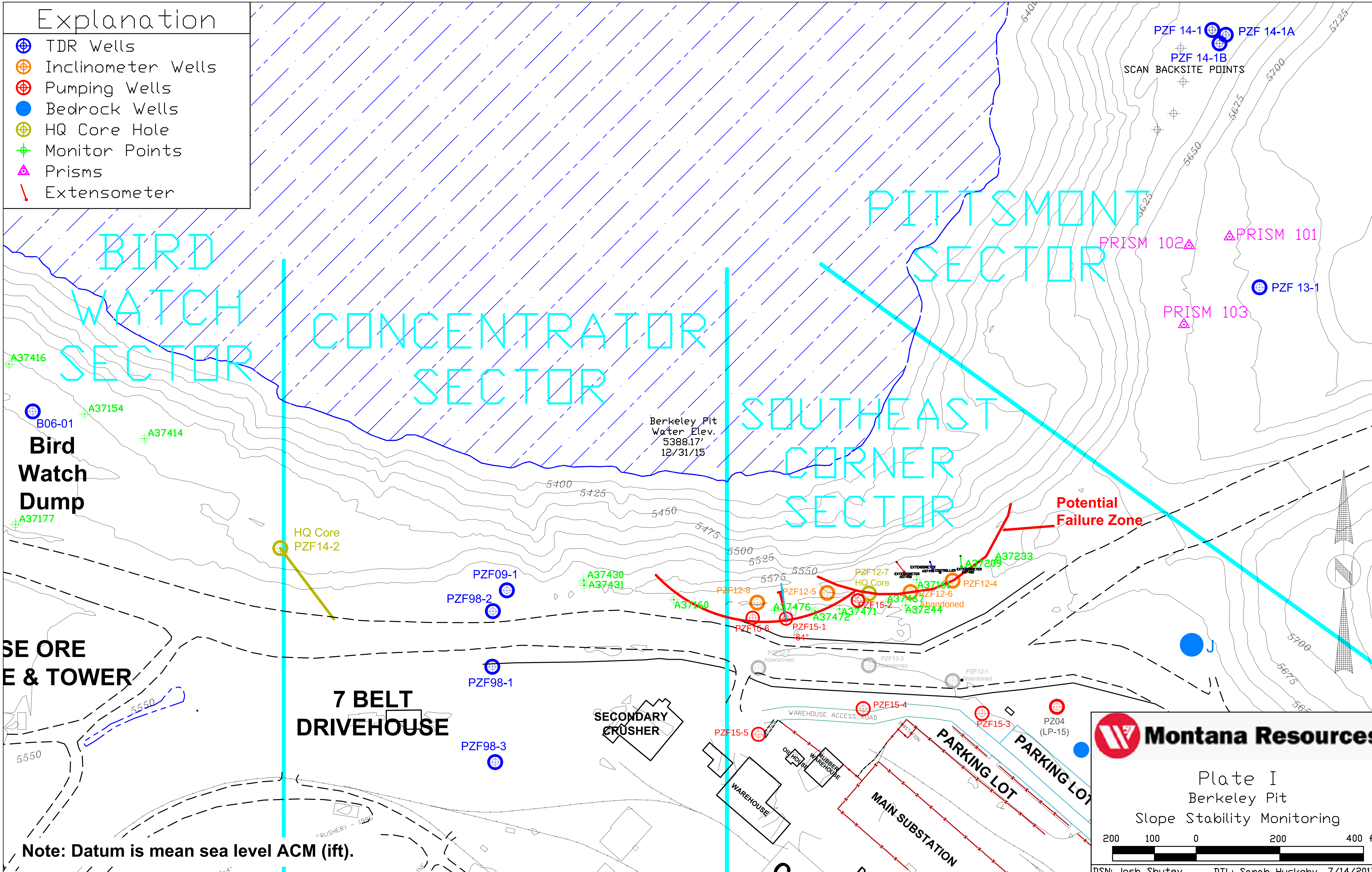
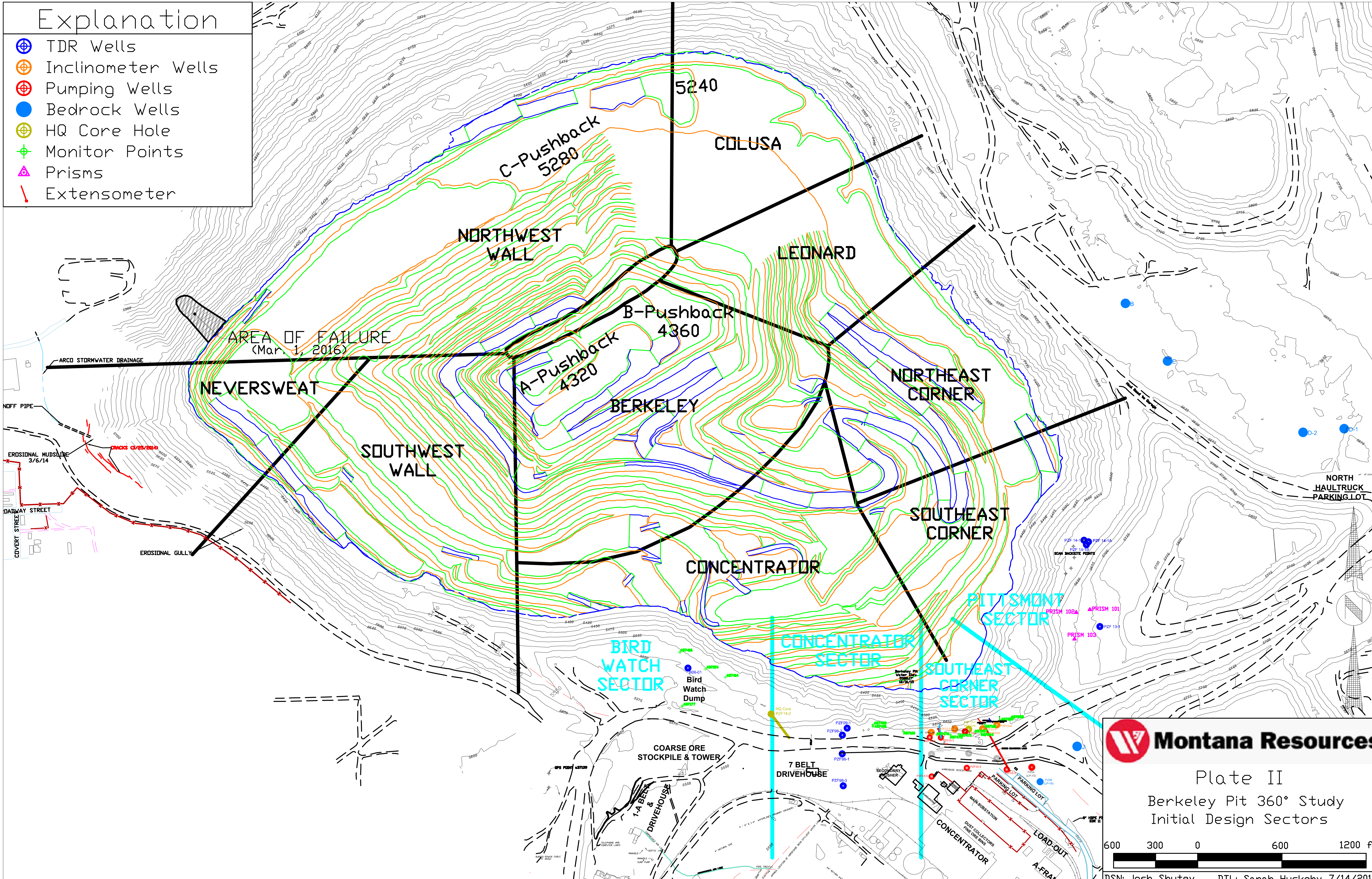


Figure 6. Hydrographs Pittsmont Sector.


Explanation
TDR Wells
Inclinometer Wells
Pumping Wells
Bedrock Wells
HQ Core Hole
Monitor Points
Prisms
Extensometer
BIRD WATCH SECTOR
CONCENTRATOR SECTOR
SOUTHEAST CORNER SECTOR
PITTSMONT SECTOR
Berkeley Pit
Water Elev.
5388.17'
12/31/15
PZF 14-1
PZF 14-1A
PZF 14-1B
SCAN BACKSITE POINTS
PRISM 101
PRISM 102
PRISM 103
PZF 13-1
A37416
A37154
A37414
A37177
B06-01
Bird
Watch
Dump
HQ Core
PZF14-2
PZF09-1
PZF98-2
PZF98-1
PZF98-3
A37430
A37431
A37160
PZF12-8
PZF12-5
PZF12-7
HQ Core
A37161
PZF12-4
PZF12-6
Abandoned
A37467
A37244
A37476
A37472
A37471
PZF15-2
PZF15-6
PZF15-1
64°
A37209
A37233
Potential
Failure Zone
PZF12-2
Abandoned
PZF12-3
Abandoned
PZF12-1
Abandoned
PZF15-4
PZF15-3
PZF15-5
PZ04
(LP-15)
J
WAREHOUSE ACCESS ROAD
SE ORE
E & TOWER
7 BELT
DRIVEHOUSE
SECONDARY
CRUSHER
WAREHOUSE
OIL HOUSE
RUBBER WAREHOUSE
SUBSTATION
MAIN SUBSTATION
PARKING LOT
PARKING LOT
5400
5425
5450
5475
5500
5525
5550
5575
5625
5650
5675
5700
5725
Note: Datum is mean sea level ACM (ift).
Montana Resources
Plate I
Berkeley Pit
Slope Stability Monitoring
200 100 0 200 400 ft
DSN: Josh Shutey
DTL: Sarah Huckeby 7/14/2017


Explanation
TDR Wells
Inclinometer Wells
Pumping Wells
Bedrock Wells
HQ Core Hole
Monitor Points
Prisms
Extensometer
5240
COLUSA
C-Pushback
5280
NORTHWEST
WALL
LEONARD
B-Pushback
4360
A-Pushback
4320
AREA OF FAILURE
(Mar. 1, 2016)
ARCO STORMWATER DRAINAGE
NEVERSWEAT
BERKELEY
NORTHEAST
CORNER
SOUTHWEST
WALL
SOUTHEAST
CORNER
CONCENTRATOR
EROSIONAL MUDSLIDE
3/6/14
CRACKS (3/25/2014)
EROSIONAL GULLY
COVERT STREET
PITTSMONT
SECTOR
PRISM 101
PRISM 102
PRISM 103
PZF 13-1
PZF 14-1A
PZF 14-1B
SCAN BACKSITE POINTS
BIRD
WATCH
SECTOR
Bird
Watch
Dump
B06-01
CONCENTRATOR
SECTOR
SOUTHEAST
CORNER
SECTOR
Berkeley Pit
Water Elev.
12/31/15
HQ Core
PZF14-2
PZF09-1
PZF98-2
PZF98-1
PZF98-3
COARSE ORE
STOCKPILE & TOWER
7 BELT
DRIVEHOUSE
1-A BELT
&
DRIVEHOUSE
SECONDARY
CRUSHER
WAREHOUSE
PARKING LOT
MAIN SUBSTATION
DUST COLLECTORS
FINE ORE BINS
CONCENTRATOR
LOAD-OUT
A-FRAME
PZ04
(LP-15)
PZ06
(LP-16)
NORTH
HAULTRUCK
PARKING LOT
Haul Road to Garage
D-1
D-2
B
E
Montana Resources
Plate II
Berkeley Pit 360° Study
Initial Design Sectors
600 300 0 600 1200 ft
DSN: Josh Shutey
DTL: Sarah Huckeby 7/14/2017